ALTERNATIVE DEVELOPMENT AND SELECTION

****
This enclosure is intended to guide scoping of the development of the optimum combination of technologies and controls for each specific contaminated area.

This section can also assist the project team in developing a preliminary list of applicable remedial technologies which would be useful in developing data quality objectives.
****

1. Type of Action
   1.1 Removal Action(s) under CERCLA

****
Removal actions should contribute to efficient performance of the long-term remedial action to the extent practicable. All removal actions are required to be consistent with the final site remediation.

Time-critical removal actions are those actions where there is less than 6 months available for planning prior to under taking the removal action. At the discretion of the lead agency, an EE/CA may be performed for time-critical removal actions.

An EE/CA is required for non time-critical removal actions. Non time-critical removal actions are defined as those actions where there is at least a six-month planning period prior to the removal action. See the EE/CA outline for additional document requirements.

Examples of removal actions are given below.
****

1.1.1 Alternate Water Supply(ies)
1.1.2 Drum Removal and Disposal
1.1.3 Excavation of "Hot Spots" to Prevent the Spread of Contamination

****
Material may be placed in secure storage or taken to a licensed treatment, storage, and disposal facility.

1.1.4 Fencing and Other security Measures to Limit Site Access.
1.1.5 Hazardous Waste storage Pond or Lagoon Pump-out with Off-site Disposal of Liquids and sludges.
1.1.6 Underground storage Tank (UST) Removal and Disposal
1.1.7 Vapor Extraction and/or Groundwater Pumping to Prevent the Dispersal or Migration of Spilled Material

1.2 Operable Unit(s) under CERCLA

****
Operable units are part of a larger remedial action. They may address specific sub-sites or portions. Operable units are required to be consistent with the final remediation but may be implemented early with available funds. Examples of operable units are given below.
****

1.2.1 Caps and/or Covers
1.2.2 Slurry Walls and/or Hydraulic Barriers that Contain and Prevent Spread of Contaminants
1.2.3 Subsite Remediation

1.3 Interim Remedial Measure(s) under RCRA

****
Interim remedial measures are required to be consistent with the final corrective measures. RCRA interim remedial measures are equivalent to the CERCLA removal action. They are responses for the reduction or control of hazards. Examples of RCRA interim remedial measures are given below.
****

1.3.1 Fencing and Other Security Measures to Limit Site Access
1.3.2 Grading and Revegetation to Control Drainage on to and off of Contaminated Areas
1.3.3 Repairs to Existing Contaminant Control Systems, Such as Caps and Leachate Collection Systems
1.3.4 Slurry Walls and/or Hydraulic Barriers that Contain and Prevent the Spread of Contaminants
1.3.5 Temporary Caps and/or Covers

1.4 Remedial Action(s)

****
Remedial actions are the long term clean up of CERCLA/Superfund sites. See the RI/FS SOW outline for additional document requirements. Examples of remedial actions are given below.
****

1.4.1 In-situ Treatment Systems
1.4.2 Biological Treatment Systems
1.4.3 Incineration of Organic Materials
1.4.4 Pump and Treat Systems

1.5 Corrective Measure(s)

****
Corrective measures are the final clean up under RCRA and are required to comply with terms of the permit, enforcement order, and/or statement of basis. See the CMS SOW outline for additional document requirements. Examples of corrective measures are given below.
****

1.5.1 Permanent Isolation of the Materials by Barrier, Cap, and Cover Systems
1.5.2 Site Excavation and Redeposition of Materials in an Approved RCRA Landfill
1.5.3 Treatment to Render the Site and Materials Non-hazardous and Non-toxic

2. Identification of ARARs

****
Input for this section of the scope should be obtained from Office of Counsel and an environmental regulatory specialist. ARARs will be solicited for removal actions and remedial actions.

There are no ARAR considerations in the RCRA process. All laws and regulations are applicable. Permits must be secured as required by various laws such as the Clean Water Act., the Clean Air Act, etc.
****

2.1 Site Based ARARs
2.1.1 Chemical-specific ARARs
2.1.2 Project/Action-specific ARARs
2.1.3 Site Location-specific ARARs
2.2 Governmental Unit ARARs
2.2.1 Federal ARARs

2.2.2 State ARARs
2.2.3 Regional/Local ARARs

3. Identification of Alternatives/Appropriate Technologies

****
Appropriate technologies depend more on the contaminated media; construction materials, rock, soil, sludge, groundwater, surface water, or air than the contaminants. Site conditions and location affect the technologies being considered.

Require the Contractor to identify alternatives including innovative technologies for removal action or remedial action. The Contractor should be required to provide necessary, defensible criteria to determine basis for action levels and for clean up requirements or for selection of the no further action alternative.

A compendium of possible alternatives/actions is included in EM 1110-2-505 Guidelines for Preliminary Selection of Remedial Action for Hazardous Waste Sites.
****

3.1 Innovative Technology(ies)

****
Consideration of innovative and alternative treatment technologies is mandated by EPA policy and the Office of the Chief of Engineers. Innovative technologies are favored by the National Contingency Plan (NCP). OSWER Directive 9380.0-17 "Furthering the Use of Innovative Technologies in OSWER Programs" provides some guidance for implementation of innovative technologies.

In-situ processes other than solidification/stabilization are considered to be innovative. Most soil treatment methods other than incineration and solidification/stabilization are considered to be innovative.
****

3.2 Alternatives that Recover Product
3.3 Alternatives that Immobilize, Destroy or Convert Hazardous or Toxic Compounds
3.4 Alternatives that Concentrate or Minimize Waste Materials

****
Include a description of the degree to which the alternative treats or recycles materials.
****

3.5 Alternatives to Land Disposal

****
Removal program policy encourages the use of alternatives to land disposal where practicable. The land ban mandates alternatives to land disposal under certain conditions.
****

3.6 Off-site Disposal

****
The cost of transportation to an off-site treatment occasionally appears to be excessive in the initial screening. This happens when the costs for on site treatment have not been fully explored. A combination of on site pre-treatment and off-site treatment in a publicly owned treatment works or a licensed treatment, storage and disposal facility may work out to be most cost effective when the preliminary screening indicated otherwise.
****

3.7 Onsite Disposal

****
Cost of site maintenance and long term O&M should be carefully considered for non-destructive technologies.

New transportable and portable equipment and processes are constantly under development that may work out for small sites with limited areas for set up of treatment systems.
****

3.8 Most Cost Effective

****
Funding uncertainties dictate retention. The most cost effective process may initially be unpopular with the management involved. The most cost effective process should be retained as a safety net above the no action alternative, even if public acceptance and political considerations rank the least cost alternative very low. Cost effectiveness is not a primary evaluation consideration under RCRA. Wise

management of limited resources dictates examination of costs and cost reduction measures. Implementation of any alternative, including no action, requires funding.
****

3.9 No Action

****
The no action alternative is required by the National Contingency Plan (NCP) on projects constructed with federal funds. For practical purposes, the no action alternative is used for a base line for risk assessment and cost. A "no action" alternative is not required for RCRA compliance.

Cost of the no action alternative should include costs for securing the site from public access and periodic monitoring in perpetuity.
****

4. Alternative Development

****
Detailed scope of alternative development is difficult and inappropriate prior to identification and quantification of contaminated media and contaminants. It is good engineering practice to include options for alternative development in investigative scopes.

Require complete development of multiple alternatives to the point that the cost of resolving difficult steps can be identified.
****

4.1 Rough Material Balance(s)
- 4.1.1 Off Gassing Potential
- 4.1.2 Intermedia Transfer
- 4.1.3 Refractory Contaminant(s)
- 4.1.4 Side Stream(s)

****
Side streams from treatment of HTRW contaminated waste materials are environmentally and economically significant. Generally, HTRW contaminants are more concentrated in the bleed streams than they were in the original waste.
****

4.2 Flow Diagrams/Plans/Schematics/CADD

****
This section would present requirements for the preparation of any drawings necessary for the FS as well as describe compatibility requirements for computer aided design and drafting (CADD).
****

4.3 Performance Modeling

****
This section describes modeling required to assist in the analysis of the alternatives. See Enclosure 10 on Ground Water Modeling and section 7 of the RI/FS outline for air modeling. General objectives of the modeling are noted here. The Contractor should be directed to elaborate on the objectives depending on the alternatives. This section should be developed with input from the process engineer, the geologist, the chemist, and the industrial hygienist (particularly for air dispersion modeling). This section should refer to the Geotechnical Requirements and the Air Section (f or air transport modeling) of the SOW for modeling protocols and other requirements.
****

4.3.1 Air Quality Modeling/Air Transport Modeling
4.3.2 Ground Water Modeling
4.3.3 Contaminant Transport Modeling
4.3.4 Geochemical Modeling
4.3.5 Process Modeling
4.3.6 Surface Water Modeling

4.4 Wetlands Restoration

****
Mitigation of habitat loss must be considered. Close coordination with the appropriate persons from the regulatory community is vital to accomplishment of the project. Federally funded environmental projects have not been exempt from the habitat restoration requirements on the basis that they are for the purpose of restoration of the environment. Preliminary scope and cost documents should include the cost of restoration or replacement of wetlands on an acre of restored or replacement wetlands per acre destroyed. See 2.10 of the RI/FS outline for additional information.
****

4.5 Life-Cycle Cost/Total Cost/Present-Worth Analysis of Each Alternative

****
Include direct capital costs, indirect capital costs, and any post-removal site control costs. The proposed removal action cost should reflect the total project cost of the remediation. Be sure the costs of connection to the nearest utilities adequate to support the remediation effort are included.

Furnish the A-E/Contractor with the discount rate to be applied.
****

4.5.1 Cost Estimates

****
This section should require cost estimates for feasibility studies which are detailed to a level commensurate with the level of design, with appropriate design contingencies applied to relevant cost items. The section should note that alternative estimates for feasibility studies, however, do not always include all the costs necessary for remediation of an HTRW project. If the sole purpose of estimating alternatives is the selection of the method of remediation, and not the total construction or project cost, some items may not require pricing. Costs which are minor, or costs which don't vary between alternatives but are common to all are frequently not included since they would not impact the selection of an alternative. This is not a problem as long as there is documentation in the report that identifies which costs are and which are not included in the estimate. The SOW should require this documentation. The selected alternative however, should reflect the total project cost of the remediation. The scope should require the Contractor to prepare estimates which consider all the following costs associated with the selected alternative. These must be considered if a total construction cost is needed for budgetary and/or programming purposes.

This section should be prepared with input from the appropriate cost engineering staff.
****

4.5.1.1 Construction Costs

****
The project leader should consult a construction representative in preparing this section.
****

4.5.1.1.1 Off-site Utility Connections and Fees
4.5.1.1.2 Mobilization/Demobilization
4.5.1.1.3 Health and Safety
4.5.1.1.4 Permits and Fees
4.5.1.1.5 Testing and Analyses
4.5.1.1.6 Operation and Maintenance
4.5.1.1.7 Transportation Costs
4.5.1.1.8 Disposal Costs
4.5.1.1.9 Contractor's Overhead
4.5.1.1.10 Contractor's Profit
4.5.1.1.11 Performance Bond
4.5.1.2 Markups

****
The SOW should require the Contractor to consider standard percentages as established in Army technical cost engineering guidance. The following markups should be applied to the construction cost to determine the total project cost:
****

4.5.1.2.1 Cost Growth-Constr. Midpoint
4.5.1.2.2 Construction Contingency
4.5.1.2.3 Supervision/Administration
4.5.1.2.4 Engineering and Design During Construction
4.5.1.2.5 Additional Lab Testing

5. Screening/Comparative Analysis of Alternatives

5.1 Technical Feasibility
5.1.1 Determination of Whether Identified ARARs Can be Met or a Waiver is Appropriate

****
Permit waivers will not be applicable to sites remediated under RCRA. All environmental laws are directly applicable and are not considered to be ARARs.
****

5.1.2 Ability to Meet Performance Goals

****
Require the Contractor to evaluate alternatives according to the likelihood of meeting performance goals. This may require modeling of the performance of the alternative. It may be appropriate to require models of the various transport

mechanisms. Reference sections 6 and 7 of the RI/FS scope for modeling protocols and other requirements.
****

5.1.3 Ability to Meet Process Efficiencies
5.1.4 Environmental Considerations/Conditions

****
Impact of environmental conditions, such as terrain and climate. For example, biological treatment is hindered by cold and enhanced by warm temperatures. Enhancements should be considered. A site located in a valley may pose a problem for a technology if surrounding air currents provide insufficient dispersion of particulates.
****

5.2 Implementability of Alternatives
5.2.1 Demonstrated Technology Performance

****
Evaluation of maturity of technology and whether it has been used under similar conditions for similar wastes.
****

5.2.1.1 Operation and Maintenance
5.2.1.1.1 Cost
5.2.1.1.2 Downtime
5.2.1.1.3 Operator License Requirements
5.2.1.1.4 Operator Skill Requirements
5.2.1.2 Requirements for Monitoring, Analyses, and Record Keeping

5.2.2 Availability.
5.2.2.1 Equipment, Materials and Personnel
5.2.2.2 Off-site Treatment, Storage, and Disposal Capacity
5.2.3 Post Removal Site Control Requirements
5.2.4 Potential for Failure of the Alternative
5.2.5 Need for Replacement
5.2.6 Description of Potential Threats from Such Failure or Replacement

****
Address the reliability of engineered components of the alternative (cap, treatment system), non-engineered components (fences), and any institutional controls (deed notices), as appropriate.
****

5.3 Institutional Considerations and Other Compliance Issues

****
Innovative and alternative technologies are encouraged. Cross media transfer without neutralization of the toxicity is discouraged by the National Contingency Plan. Compliance with SARA requirements is required. Assure that all actions are consistent with the long-term remedy for the site.
****

5.3.1 NEPA/NCP Issues
5.3.1.1 Historical Preservation
5.3.1.2 Archaeological Preservation
5.3.1.3 Natural Resource Preservation
5.3.2 Likelihood of Public Acceptance of the Alternative
5.3.2.1 Public Interaction
5.3.2.1.1 Public Meetings
5.3.2.1.2 Public Notices
5.3.2.1.3 Public Acceptance
5.3.2.2 State concerns
5.3.2.3 Regional/Local Concerns
5.3.3 Administrative Feasibility/Institutional Issues
5.3.3.1 Coordination with EPA Region
5.3.3.2 Coordination with Other Federal Agencies
5.3.3.3 Coordination with State Agencies
5.3.3.4 Coordination with Regional Air/Water Quality Boards
5.3.3.5 Coordination with Local Agencies
5.3.3.5.1 County Government
5.3.3.5.2 City/Municipal Government
5.3.3.5.3 Local/Neighborhood Groups
5.3.3.6 Required Permits or Approvals

****
The RCRA permit shall be amended to account for all actions taken on site. Permits are not required for CERCLA actions conducted onsite. Substantive compliance with permit requirements is required.
****

5.3.4 Other Compliance Issues
5.3.4.1 Criteria
5.3.4.2 Advisories

5.3.4.3 Guidance

****
Description of compliance with other criteria, advisories or guidances that are not ARAR, but could appropriately be applied to the site. For example, if PCB contaminated soil would be excavated in the alternative, compare the cleanup level the alternative will achieve (the level described under "threat reduction" above) with the cleanup levels established in the EPA PCB Spill Cleanup Policy.
****

5.4 Effectiveness of Alternatives

****
Require the Contractor to evaluate the effectiveness of the alternative for risk reduction and the time frame for this protection to be achieved. In some cases this may involve modeling of the action. If appropriate, refer to the modeling protocols presented in section 7 of the RI/FS scope.
****

5.4.1 Protection of the Community during Removal
5.4.2 Protection of Workers during Removal
5.4.3 Risk/threat Reduction.

****
In accordance with the National Contingency Plan, alternative screening and analysis shall include numerical analysis of risk to human health and environment engendered by the alternative compared to the risk developed by the baseline risk assessment. Risk attenuation may be measured qualitatively or quantitatively (e.g. cleanup levels or cancer risk levels achieved), as appropriate.
****

5.4.3.1 Time Until Protection is Achieved
5.4.3.2 Potential Exposure to Remaining Risks
5.5 Environmental Impacts

****
This section would require the Contractor to evaluate each alternative for the impacts to the environment to meet the equivalency requirements under National Environmental Policy Act. Emergency and time-critical removal actions are exempted from compliance with the Environmental Impact Statement (EIS) requirements of NEPA based on statutory

conflict. All non-time-critical removal actions require environmental review of the EE/CA and public comment. An EE/CA performed under EPA Guidance may be considered a "functional equivalent" to a NEPA EIS if the following items at a minimum are included in the EE/CA report:

- Site characterization.
- Identification of objectives.
- Identification of removal action alternatives.
- Initial screening of alternatives based on various factors.
- Analysis of remaining alternatives based on various selection criteria.
- Recommended removal action.
- Opportunity for public comment.
- Decision documentation.

Input for this section of the scope should be obtained from the environmental regulatory specialist, a team member familiar with NEPA requirements, Office of Counsel, and possibly from environmental resource specialists (normally found in Planning Divisions in the Corps).

Refer to RI/FS or EE/CA guidance for appropriate content for this section. Additional relevant explanatory text can be found in the RI/FS scope outline under NEPA Compliance Activities (section 2.10).
****

6. Comparative Analysis

****
Qualitative assessment of strengths and weaknesses of each alternative relative to the others. Summary tables would be helpful, with alternatives along one axis and evaluation criteria along the other axis. Use total cost instead of construction cost.
****

7. Recommended Alternative

****
Final selection to propose to the regulators is the responsibility of the customer after consideration of input from the concerned parties and the public. The regulators have approval/disapproval authority under most conditions.

Designer and/or design agency recommends alternative to the user. The selected alternative is not necessarily the least

cost and does not always meet all of the ARARs. The report should go no farther than a recommendation. Discussion of the bases for selection is included with the recommendation.

Consider all of the ultimate disposal requirements for all phases and side streams.

As required by 40 CFR 300.70 selection shall be based on a combination of life cycle cost, technical, and environmental/social concerns. RCRA corrective measures do not consider cost. The RCRA cost estimate is needed for budget and programming purposes.